**Second Workshop on
Indicators in the
Knowledge Economy**

Maastricht, 6 - 7 October 2005

An academic's (and personal) perspective on policy challenges

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I. How academic people can help for KE indicators and policy?

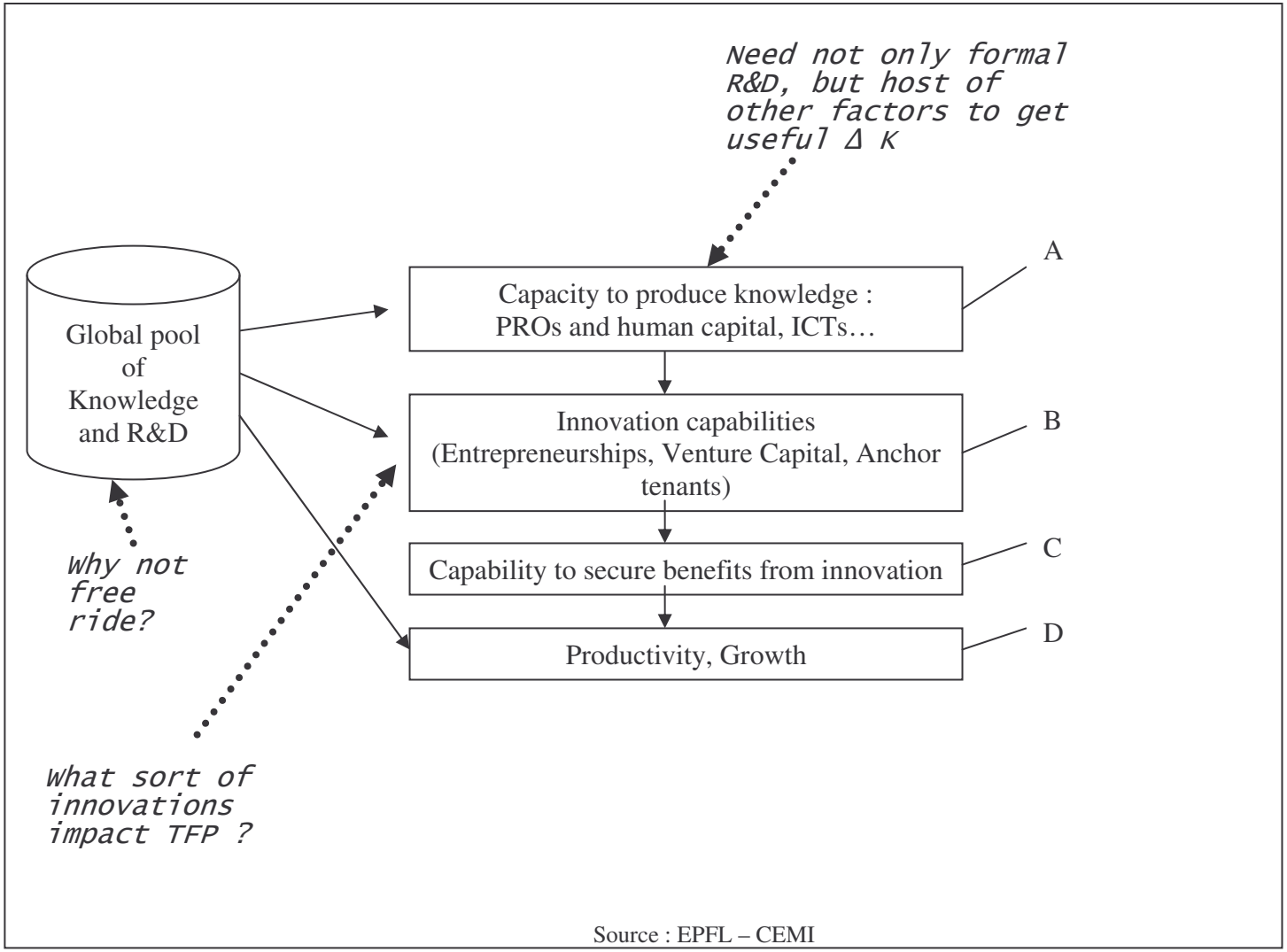
6 points to fit the policy challenges for a knowledge economy:

- To give a framework workable for policy makers and statistical offices
- To help statistical institutes for the treatment of data (a trivial issue they do not control)
- To use the indicators and reveal the unsolved issues for policy makers
- To help statistical institutes with complementary surveys and data sets, to discover what is behind usual indicators (deepening)
- To deals with critical aspects not (yet?) covered by usual indicators and thus help statistical institutes to define hot variables & questionnaires (Some of them have already been presented in KEI workshop)
- To focus their research agenda on puzzling issues raised or ignored by indicators (a wish)

They also need helps to overcome difficulties

FEW EXAMPLES ARE GIVEN IN THE FOLLOWING SLIDES

II. An broad model for indicators: the A-B-C MODEL FOR global KE



Source : EPFL – CEMI

THE TARGET FOR A KNOWLEDGE ECONOMY IS TO SUCCEED TO CHAIN THE 4 STAGES

Rough examples :

A+B+C = Leading countries (United States, Sweden, Switzerland,…)

A+B : Broken wings countries (Israel)

B+C= Smart opportunists (Ireland, Singapore)

D : Free riding countries (Greece, Portugal, Brazil,…)

A+D : Missing link countries (Russia, India, China?)

Indicators and research could be used and developed to fit each stage and interactions in the model

Let use this framework to give the few examples of academic tribute to KEI

III. On the A side (capacity to produce knowledge)

Economics of science is a hot new field in economics

- PROs are building data sets on their own labs (EPFL, Leuven, BETA, Rob Low's initiative in the US)
- PROs are launching surveys (Université Paris Dauphine)

Example : the EPFL data at the individual level we are building :
Data on : teaching, publications, inventions, patents, start ups, board members, TTOs activities, incentive rules, public funding, careers (R&D contracts, consulting,)

It induces :
- A costly lack of coordination between local initiatives
- A need for a new manual (enlarged Frascati manual?) to get comparability between the different PROs

IV. On B side (capacity to produce innovation)

3 examples of academic contribution to the debate on Knowledge economic policy:

- On networking
- On innovation benchmarks
- On ability to change or to catch up

A. Example 1 : On networks, clusters and cooperation

1. Are networks local?

A cooperation between French statistical offices and academic researchers led to a survey dedicated to networking

The location of the 3 main R&D partners, by size classes (%)

Employees	Local	Regional	National	E.C. level	Other
Under 20	16	27	29	20	8
20-99	18	22	40	16	4
100-499	5	27	51	12	5
500-1999	3	23	46	26	2
2000 and more	5	17	30	40	8
Total	11	25	41	18	5

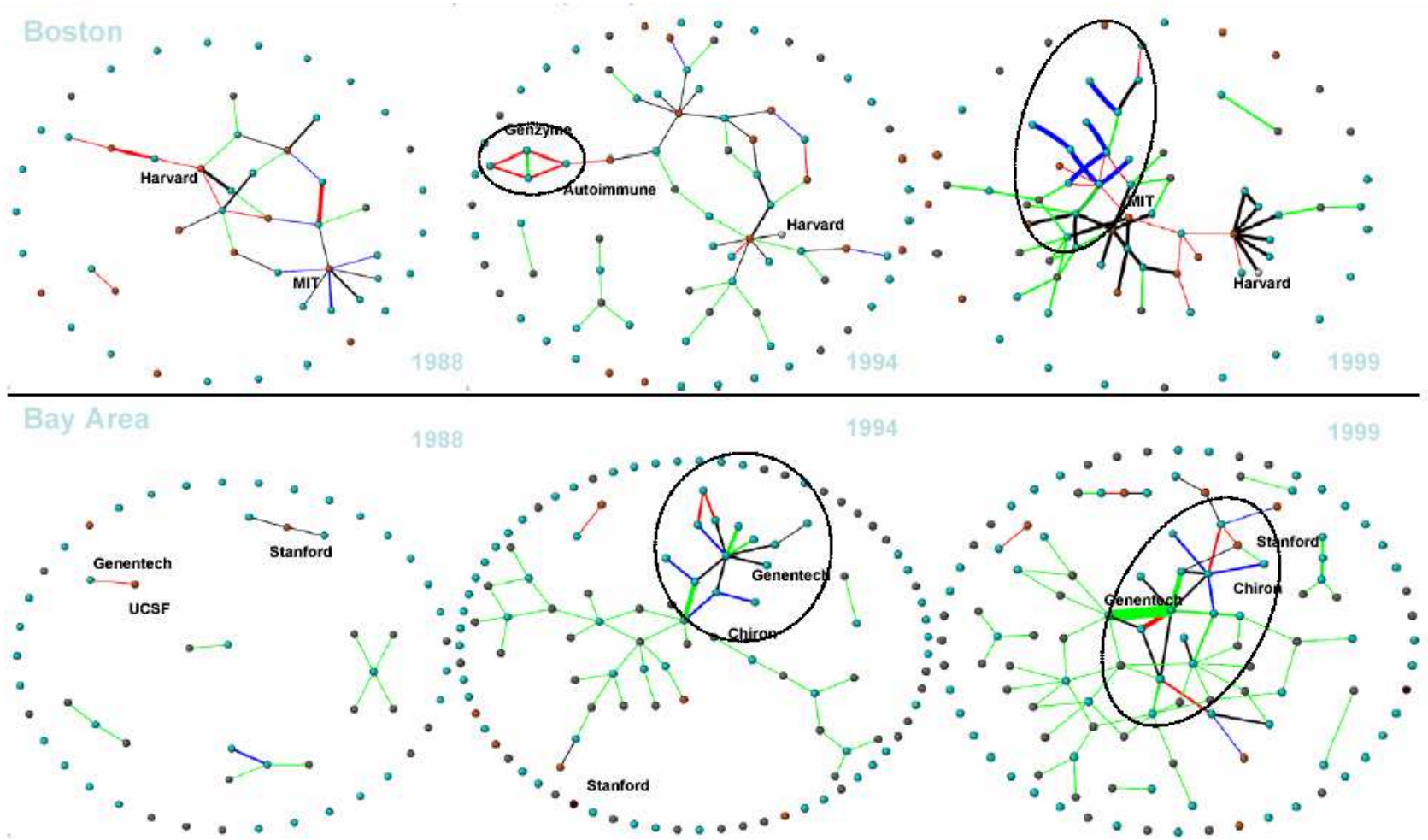
Source : ERIE, 2003 (SESSI & DEP B3) :

- R&D Networks are not local but rather national or even international
- This is true for firms or public research organizations
- But (local) industrial dynamic may still exist despite this general result!

2. The anchor tenant hypothesis?

An academic result on USA : Entrepreneurship and growth in the knowledge economy requires an Anchor tenant firm (NBER, 2002)

A second result here, on US Biotech (Powell, 2005)



East Cost : MIT and Harvard University are at the core of the biotech cluster
Bay area : Venture capital and few firms are at the core of the biotech cluster (e.g. genentech).
Stanford University is a marginal actor here.

Consequences on indicators :
New ones are thus required here!
On new actors : venture capitalists, spin offs from PROs
On M&A

But it will not give solutions to the policy makers:

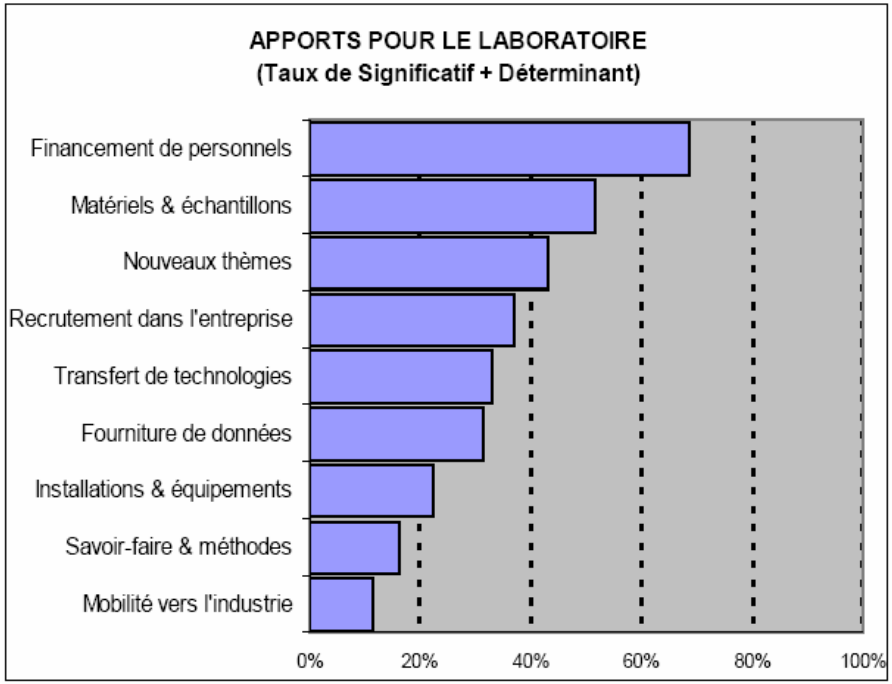
- to help the actors (to invest in R&D) or the link between the actors (indirect policy)
- what kind of actors help?
- what kind of relation help?
- when to help?
- to reinforce existing links or to create new ones?
- what is the level of intervention (firms, R&D labs, individuals)?
- To help networking through infrastructure (airports, fairs, High speed information networks...)?
- To help dyadic cooperation or larger ones?

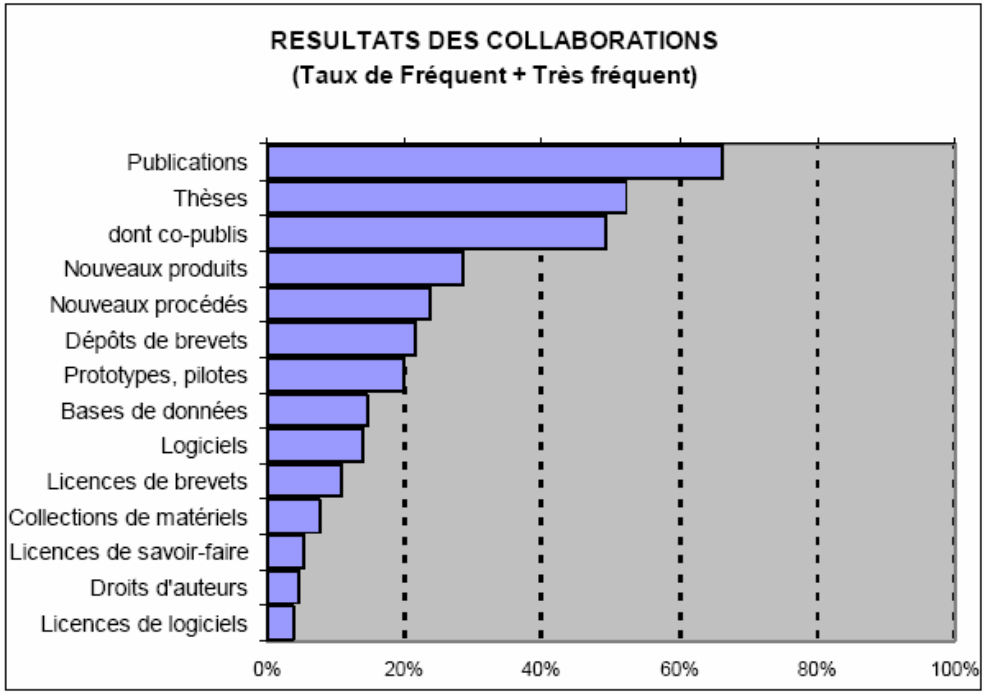
Further results are required to give clues to policy makers!

Let see 2 examples on France trying to understand networking

- Why does PROs cooperate with firms?
- How to improve R&D cooperation efficiency?

3. Rationale for cooperation





Goddard J.G. & Isabelle M., IMRI, Université Paris Dauphine - 2005

French labs use R&D cooperation with firms to publish and keep larger teams.
About 10 000 researchers can considered as “moonlight workers” in French PROs

4. What are the determinant of cooperation failures?

Among innovative firms, 44% cooperative firms, among them 29% declare failure

A Probit model with sample selection gives (On French CIS2, Galia & Lhuillery, 2005):

- collaborate with Parent, Suppliers, Consultants and Universities do not rise the probability to fail
- collaboration with Competitors or Public Research Org. induce a 5% raise of the probability to fail
- the rise is 3% for a R&D collaboration with Customers
- Firm with an international dimension (at least one international collaboration, 68% of firms) compared to firms with restricted French cooperative links rise its probability to fail by 4%
- No learning effect : CIS2 cooperative firms rise their probability to fail by 1% if they had previous R&D collaborations (CIS1)

AND

- <u>Internal R&D intensity lower the probability to fail</u>

B. Example 2 : Fine tuning of S&T policies through a precise benchmarks Karlsruhe (ISI initiative)

Technological position of countries compared to Germany (logit controlling for size and 2 digit NACE industries)

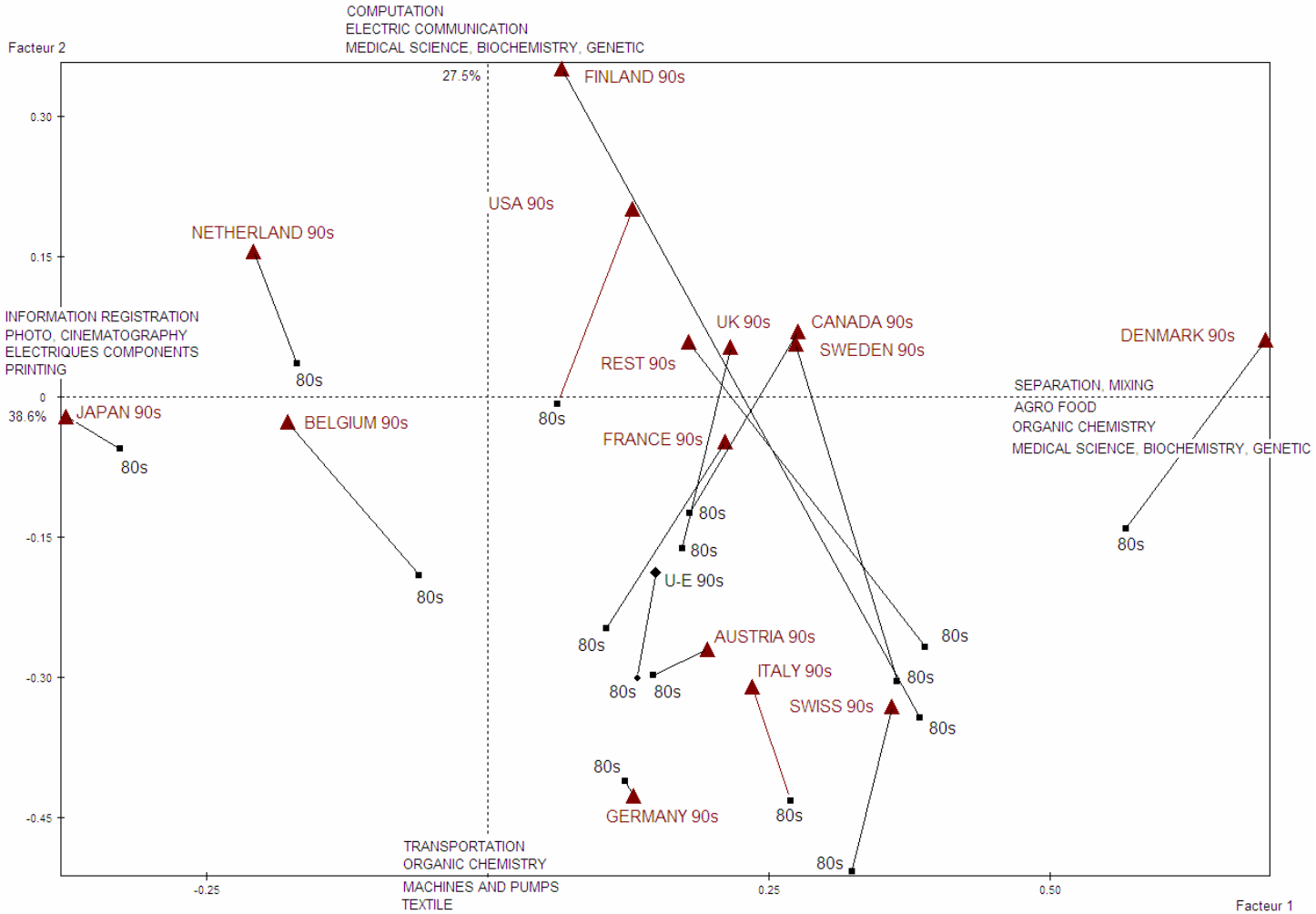
Les techniques utilisées actuellement par votre entreprise ?	-	=	+
Technologies de l'information (ICTs)			
Vente de ses propres produits sur Internet (commerce électronique)	FRA, ITA	UK, CH, AUT SLO, CRO, TUR	
Achat auprès des sous-traitants via Internet (Approvisionnement électronique)	FRA, ITA, CRO	AUT, UK, SLO, TUR	CH, AUT,
Intranet pour gestion des connaissances		FRA, SLO, CRO	CH, AUT,
Utilisation des services à distance (diagnostic/maintenance à distance via modem)	ITA, CRO, SLO, UK	CH, FRA, TUR	AUT
Simulation pour le dimensionnement des produits (calcul par la méthode des éléments finis)	CRO	CH, AUT, SLO	FRA
Simulation des différentes étapes du processus (p.ex. Simulation de transformation ou de soudure par la méthode des éléments finis)		CRO, CH, AUT, SLO, FRA	
Simulation du déroulement (p.ex. parcours du matériel, prévention de collision)	FRA	CRO, CH, AUT, SLO	
Module PPS/ERP d'un logiciel intégré de gestion d'entreprise (p.ex. Module PP de SAP)	UK, FRA, ITA, SLO, CRO	AUT, TUR	CH
Product Lifecycle Management System (PLM)	FRA	AUT, SLO, ITA, CRO	CH
Echange de données de disposition avec autres entreprises (Supply Chain Management)		UK, ITA, FRA, SLO	CH, AUT, TUR
Mise en réseau de la CAO et de la programmation CN (transfert de données géométriques)		CH, AUT, SLO, CRO, FRA, TUR	UK
Machines et installations			
Centre d'usinage CNC	FRA, UK, ITA, CRO	AUT, SLO, TUR	CH
Usinage à sec/lubrification minimale pour des pièces traditionnellement usinées par procédé humide	ITA	CH, AUT, SLO, CRO, UK, FRA	TUR
Usinage à grande vitesse (HSC; vitesse de coupe > 300 t/min)	ITA	CH, AUT, SLO, CRO, UK, FRA	TUR
Robots industriels et systèmes pour le maniement des outils/pièces	CRO	AUT, SLO, FRA, TUR, UK, ITA	CH
Systèmes automatiques de manutention des matériaux (fabrication et/ou montage)		AUT, SLO, CRO, TUR, UK	CH, FRA, ITA
Stations de montage automatisées	CRO	CH, AUT, SLO, ITA, UK, FRA	TUR
Imagerie dans la production (contrôle de qualité, commande du processus)	FRA	AUT, CRO, UK	CH, SLO, TUR, ITA
Contrôle de qualité par processus intégré (p.ex. avec laser, échométrie	FRA	AUT, SLO, CRO	CH
Prototype rapide, outillage rapide, usinage rapide (p.ex. Stéréolithographie)		CH, AUT, SLO, CRO, ITA, UK, FRA	TUR
Utilisez-vous des procédés de fabrication pour traiter et ajouter les matières suivantes dans votre entreprise			
Matériaux de construction légère métalliques (alliages de titane, de magnésium etc.)	FRA	AUT, SLO, CRO	
Matériaux composites (p.ex. Fibre de verre et de charbon)		AUT, SLO, CRO, FRA	
Matières premières régénérant		FRA, AUT	SLO, CRO

Logit model controlling for size and nace code at the 2 digit level.
AUT: AUSTRIA, CH :SWITZERLAND, CRO : CROATIA, FRA :FRANCE, R-U :UK , ITA :ITALY, SLO : SLOVENIA, TUR :TURKIA
Source : ISI, FhG, 2005

C. Example 3 : Country changes or country deepening ?

1. Sustainable specialization or fatal inertia for E.C. countries?

Technological specialization and its evolution based on OECD triadic patents

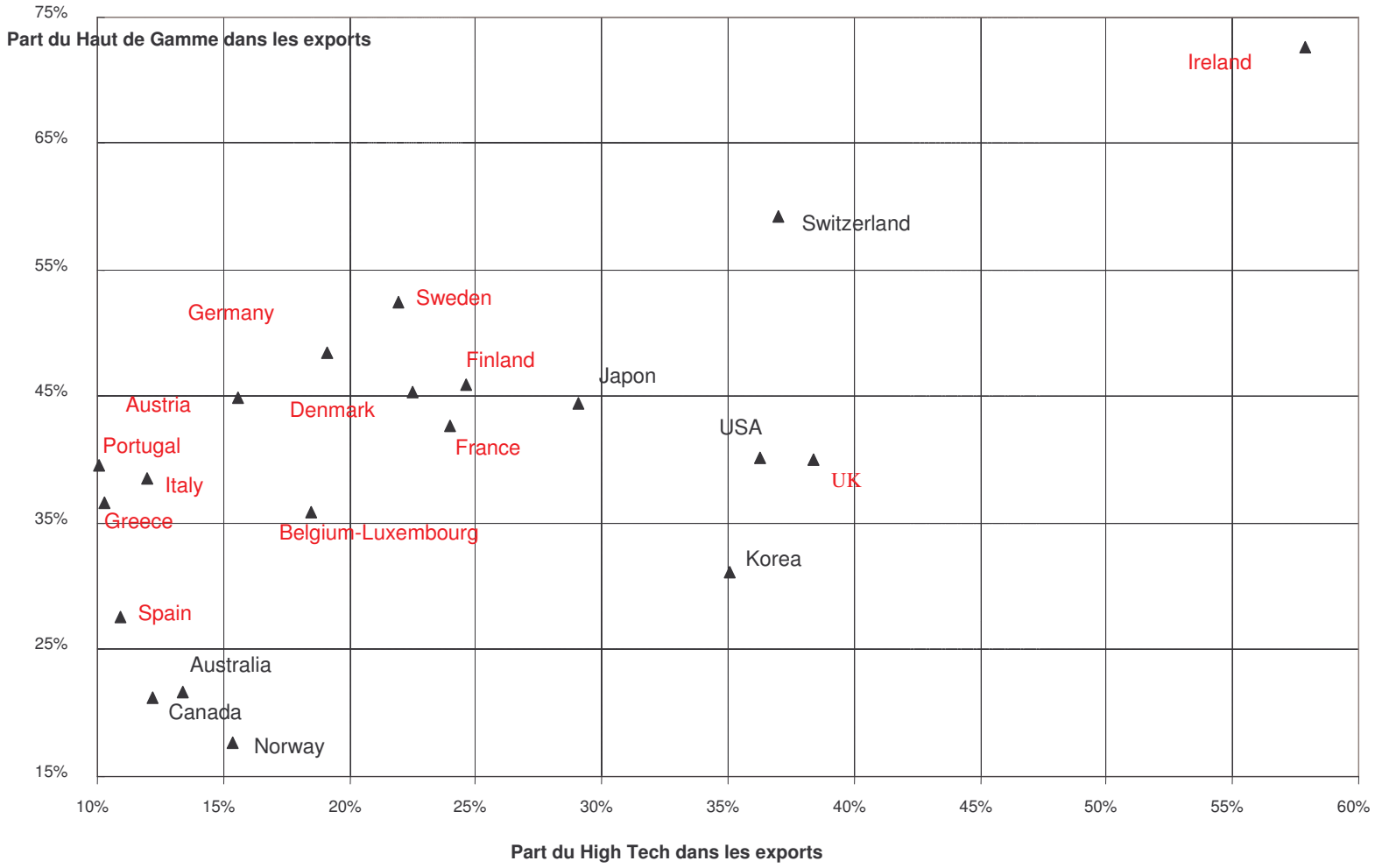


Source : Brevet triadiques de l'OCDE

Factorial analysis (Lhuillery, 2005)

2. Sustainable differentiation?

High quality exportations, by OECD countries



Horizontal axes : year 2002, source OCDE
Vertical axis : year 2003, source CEPII-BACI, G.Gaulier

RED : EC countries

V. On C side (to capture benefits)

3 examples :

- How to secure rents from High tech industries?
  - What are sectors with sustainable advantage and growth potential?
  - What are strategic complementary high tech services to appropriate high tech products

- Control, Merger & Acquisition of High Tech start-ups and spin offs

How to keep firms with high growth rate potentials?

- Innovation and business cycles are closely linked (see CIS surveys)

How to implement a counter-cyclical innovation policies?

VI. International Knowledge flows (On arrows with the global pool of knowledge)

The issue here is the identification of sources of technological spillovers
- Many indicators are considered as possible channel for knowledge flows!
- Many econometric results are already available

For example:

A positive influence of globalisation on productivity :
- Product flows (Coe and Helpman, 1995b; Lichtenberg and van Pottelsberghe de la Potterie, 1998).
- Inward FDI influence (Keller and Yeaple, 2003, Girma et al., 2004).
- Outward R&D FDI (van Pottelsberghe de la Potterie and Lichtenberg, 2001).
- Technology flows (patents, licences, R&D results…) (Soete and Verspagen, 1994, Mohnen and Gallant, 1993; Mohnen and Lepine, 1991; Soete and Patel, 1985).
- Human capital flows through students (Park, 2004)
- International R&D cooperation (Cincera et al., 2003).

A negative influence of technology flows (Luintel and Khan, 2004).

Each channel seems to be active as a knowledge provider even if results are not robust at the moment

Thus the academic literature leads to several unanswered and difficult issues:

- What are the best channels to grasp knowledge?
- What are the means available for policy makers?